

## **The Scientific and Historical Foundations of Earth System Science**

Dr. Robert W. Corell

Heinz Foundation

The foundations of the sciences of the Earth system were seeded by some of the great scholars of the last hundred or so years, beginning in many way with the recognition in 1896 by Professor Svante August Arrhenius, a the Swedish scientist who calculated that emissions from human industry might someday bring a global warming, setting an early pathway to the studies of the earth as a system. A keystone benchmark in the development of concepts to understand the Earth as a system is Roger R. D. Revelle, who along with Hans Suess stated, *“Human beings are now carrying out a large scale geophysical experiment of a kind that could not have happened in the past nor be reproduced in the future. Within a few centuries we are returning to the atmosphere and oceans the concentrated organic carbon stored in sedimentary rocks over hundreds of millions of years. This experiment, if adequately documented, may yield a far reaching insight into the processes determining weather and climate.”* However, as we know now, extensive research and scholarly studies in the Earth system science began in 1983 in the foundational work of the NASA Advisory Council established the Earth System Sciences Committee, chaired by Francis Bretherton, who then published the seminal report *“Earth System Science: A Program For Global Change”* in 1988. The committee showed for the first time how the many components of the Earth systems interact and depicted in the now famous “Bretherton Diagram.”

It was from this foundational work that the United States Global Change Research Program was founded in 1987 and lead to the codification by Congress the Global Change Research Act of 1990, in order to provide for "...development and coordination of a comprehensive and integrated United States research program which will assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change...and to increase the overall effectiveness and productivity of Federal global change research efforts." It is within this framework that we will explore the history, policies and implementation of the NASA's Earth Observations System (EOS) and U.S. Global Change Research Program, including some stories of the major players.